

been discovered since the second edition of this book was printed, and in which the author has himself borne an honourable part, are, if we except an example very near to the end of the book, not mentioned.

THE MAGNITUDE OF THE PROTEINIC MOLECULE.

Die Grösse des Eiweissmoleküls. By Dr. F. N. Schulz. Pp. viii + 106. (Jena: Gustav Fischer, 1903.) Price 2.50 marks.

THIS work is the second part of the author's "Studien zur Chemie der Eiweissstoffe"; the first part is entitled "Die Krystallisation von Eiweissstoffen und ihre Bedeutung für die Eiweisschemie," and is also published by Gustav Fischer.

The book is composed of five chapters. The first deals with elementary composition as a measure of the magnitude of the proteinic molecule, and fills twenty-four pages. In it the author discusses firstly the ash of proteins. This he divides into essential and non-essential parts, without predicating chemical essentiality of the former. He concludes that the ash is of no value for the purpose under consideration. He deals next with the sulphur, and shows that it can be used to give minimal values. It is pointed out how the difference in the ease of its elimination affects the results, and the methods of its determination are discussed.

In the second chapter the products of substitution are considered. This chapter contains fifty-three pages. Of the natural bodies oxyhæmoglobin and casein are the only ones lending themselves to calculation. Consideration of artificial products yields no figures of value at present. The substances resulting from association of acids and bases with proteins are not as yet available for purposes of calculation. The same may be said of those of metals with proteins, with the possible exception of Harnack's copper-albuminates. The author points out, however, that these substances need closer study.

In connection with these bodies the author diverges into a consideration of certain properties of colloids, and indicates that associations of colloids may simulate chemical compounds. He states emphatically that use of such words as *combination* and *compound*, in the case of certain proteins and proteinic derivatives, may be unwarranted:—

"Eine Hauptaufgabe dieser Abhandlung war es gerade, dass gezeigt wird, dass bisher *keine zwingenden Gründe* vorliegen, um z. B. bei den Metallalbuminaten, oder später bei den Halogenalbuminaten, Verbindungen der Eiweissstoffe nach stöchiometrischen Gesetzen annehmen zu müssen."

The products of interaction of proteins and halogens (especially iodine) are dealt with at some length. The absence of harmony in the results of different observers is shown, and the complexity of the process is pointed out. The conclusion is reached that these substances are not yet trustworthy for computational purposes.

The subject is regarded in the third chapter from the aspect of the products of hydrolysis, and it is found that no single compound is of use for the required calculation. The chapter contains nine pages

The fourth chapter, which consists of six pages, deals with physical methods, and chiefly with the cryoscopic one. The author has again to regard the results with suspicion, owing to the ash and the undefined nature of the substances. There is apparently an indication that the molecular masses of peptones, proteoses, and more complex proteins stand to one another in a series of increasing magnitudes. The numbers attached to the two former classes may be of the right order; those connected with the latter are, however, valueless.

The final chapter, containing four pages, is devoted to conclusions. The author considers that the present state of the subject is very unsatisfactory, and that the molecular magnitudes of the more complex proteins cannot be even given with approximate certainty. Selected minimal values, as those of Vaubel, lying for the more complex proteins between 5000 and 15,000, can be made to give apparent harmony. But, if selection is not made, the result is very different.

The necessity of starting with crystalline bodies, and of improved methods is emphasised. The author also lays stress on the necessity of studying proteins in their colloidal aspect, saying:—

"Ich bin der Meinung, dass eine gründliche Erforschung der colloidalen Eigenschaften der Eiweisskörper, das Räthsel der Eiweisschemie eher aufklären wird, als eine detaillirte Untersuchung der Krystalinischen Eiweisspaltungsprodukte."

He adopts throughout a position of impartial criticism, which is eminently sound. The results hitherto obtained have for him no great positive value at present; this he attributes to insufficient precision in the modes of investigation, although admitting that the cause may be inherent in the proteinic nature.

Some might urge that publication is in these conditions premature. But in the present state of proteinic chemistry such a pamphlet as this, permeated with sane criticism, and summarising what is known in a clear and agreeable manner, can only be of value. The just appreciation of the extreme importance of a study of the colloidal nature of proteins is a main feature of the work.

It is a regrettable fact that no index of subject-matter is appended, although there is one of authors, and a table of contents.

F. ESCOMBE.

PHYSIOLOGICAL REPORTS.

Reports from the Laboratory of the Royal College of Physicians, Edinburgh. Edited by Sir John Batty Tuke, M.D., and D. Noël Paton, M.D. Vol. viii. (Edinburgh: Oliver and Boyd, 1903.)

THIS volume represents the work done in the laboratory in 1900 and 1901, and though a year late in its appearance is none the less welcome for that. Apart from one paper on the pollution of the Tyne Estuary, it is devoted to pathology and physiology.

Throughout there are records of the energy and helpfulness of the superintendent, Dr. Noël Paton, and no less than one-third of the articles are by him, either alone or in conjunction with others. Indeed, his

interests are perhaps too multifarious, for one or two of his papers seem to have come into print before the observations they contain were ripe for publication.

Nothing, however, could be more elaborate or painstaking than the opening article, a study of the dietary of the labouring classes of Edinburgh, of which the expenses were partly defrayed by the progressive Town Council. The details were procured by a band of lady students, and are often amusing if not always essential. Thus we are glad to learn that a lady who dresses "in the Canongate fashion of a loose blouse" gets on well with her neighbours, but tragic possibilities follow on our introduction to the husband; "Mr. T. is not a teetotaler and he smokes."

The most interesting result of the study is the startling discovery that porridge is rapidly disappearing as a staple article of diet with these people. In fact, the investigation might have been entitled "A Plea for Porridge," for the authors rightly insist upon its economic value.

Of the other articles, the longest is a contribution to the histology and metabolism of the foetus and placenta of the rabbit, by Dr. Chipman. With so difficult a subject, and so confused a terminology, the author's lucidity of style is very welcome, and the illustrative microphotographs, numbering no less than 186, are eloquent of his sincerity. He throws light on many controversial points, e.g. the manner of first contact of the embryonic and maternal tissues, the "unequivocal differentiation" of these two tissues, and the relations of placental and foetal glycogen. It is a pity that he says nothing of the glycogen in the foetal muscles, where it is said to exist sometimes to the extent of 40 per cent. of the dried tissue. There is much about the formation of "fibrinous tissue" from extravasations of blood, but he ligatured the vessels at the outset to ensure, as he explains, an injection of the placenta, and we would suggest that these extravasations may have been, in part, an artefact.

Dr. Rainy's paper on the action of diphtheria toxin on nerve cells is so excellent, so far as it goes, that we look forward to a further instalment next year. He obtains very definite intracellular effects, and avoids error by a most thorough series of controls. Also he gives an admirable history of the subject.

There are many other minor articles of varying value. Dr. Carmichael, working at the infections of the gall-bladder, injected microorganisms into a mesenteric vein in five rabbits, and since he gets but one positive result, he concludes that infection can occur only by direct extension or by the cystic artery; of such factors as the virulence of the organism, the nature of the animal, and the condition of the gall-bladder he takes no account.

We are glad to see that Miss Huie is continuing her observations on the histology of cell-metabolism which she began so successfully in Oxford. Dr. Dunlop, in some observations on prison diets, confirms Atwater's finding that Voit's classical standard of diet is too low. Finally, we would mention a curious study by Dr. Berry in comparative morphology, in which he concludes that the vermiform appendix is not vestigial but the summation of a long development.

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OUR BOOK SHELF.

An Elementary Treatise on the Mechanics of Machinery, with Special Reference to the Mechanics of the Steam Engine. By Joseph N. Le Conte. Pp. xi+311; with 15 plates. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1902.) Price 10s. 6d. net.

THE author states that this book is the outcome of a series of lectures given to engineering students in the University of California.

In an introductory chapter relating to uniplanar motion, some properties of instantaneous centres and centrodes are given, and methods are set out of determining relative velocities, both linear and angular.

The next part is devoted to machinery of transmission, comprising rigid and flexible couplings, friction gearing, belt and rope gearing, and toothed gearing, the shafts being parallel, intersecting, or crossing, respectively. This part also includes chapters on parallel motions and cams.

The author has a leaning towards analytical rather than graphical treatment, and prefers accurate and complete investigations to simplified approximations. This is apt to result in formulæ which convey little meaning, and which repel by their complexity, requiring the subject-matter to be of great importance to justify their use. Thus in the discussion on wheel teeth there is an investigation into the equation to the profile which shall correspond with any given curve of action; and formidable expressions are given for calculating the angles of action in cycloidal and involute teeth. We should like to have seen these supplemented by graphical methods, using tracing paper and a prick, after Mr. Last, whereby wheel teeth can be set out with perfect accuracy, with the minimum of trouble, and in such a way as to bring very prominently into notice the nature of the action between a pair of teeth.

Part iii. deals with the steam engine, the first chapter relating to the kinetics of the "piston-crank chain." Accurate formulæ are established giving the position, velocity and acceleration of any point moving with the connecting rod referred to the crank position, from which are deduced the special values for the centre of mass, the crosshead and crank pin. Formulæ for angular motions of the connecting rod are also given. In this chapter the simple and gridiron slide valves are considered, and also the Meyer and Thompson gears, Zeuner's valve diagram being used along with the formulæ.

Chapter ii. of this part is taken up with the dynamics of the steam engine, and investigates piston and crank efforts, inertia effects, counterbalancing, and the actions of the fly-wheel and governor. The formulæ of the preceding chapter are used to calculate the force actions in a small horizontal engine due to acceleration of the connecting rod for a number of points in the cycle; these are tabulated, and the results plotted in plates at the end of the volume.

In the mechanics of the steam engine, the use of the Fourier development, with the conception of rotating vectors, is preferable to the method adopted by the author. The series converges so rapidly that it is seldom necessary to go beyond the second or octave term, and a very clear view is obtained of the secondary actions due to obliquities of the connecting and eccentric rods.

The principle of balancing the forces on the crankshaft of an engine, ignoring those on the frame, is novel, and leads to curious results in the case of the Southern Pacific locomotive selected by the author as an example.

The investigation of the action of fly-wheel governors seems very complete, and is worth study.